THE ELEVATION RANGE OF THE POSSIBLE MERIDIANI/ARABIA PALEOSHORELINE, MARS.
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Introduction: The original global mapping of the putative martian paleoshorelines [1-4] was limited by resolution of Viking images. Besides this, it is fairly evident that diverse degradational processes could have affected the original morphology (and topography) of any putative paleoshoreline. Thus, reevaluations of paleoshorelines mapping are probably guaranteed [5-7]. These revaluations would be of great interest to improve the knowledge the hydrogeological history, but also for the tectonothermal history of Mars, because they could affect the elevation range attributed to a given paleoshoreline. The possibility that the putative Meridiani shoreline could be the same feature as some portions of the Arabia shoreline was first suggested by [5]. Indeed, the mean elevation in the Meridiani shoreline is roughly similar to that of the Arabia shoreline in northeastern Arabia, Utopia (not taken into account the Isidis impact basin), Elysium, and Amazonis regions. Thus, a possible paleoshoreline might follow the outline of the Arabia shoreline in these regions, but including the outline of Meridiani Shoreline in western Arabia Terra and Sinus Meridiani.

Here we estimate the elevation range of the putative Meridiani shoreline, using the mapping in [4] and MOLA topography. We also estimate the elevation range of the "mixed" Meridiani/Arabia paleoshoreline.

Elevations ranges along the Arabia and Meridiani shorelines: The putative Arabia shoreline shoreline, which would be of Noachian age [4], is roughly coincident with the Martian dichotomy separating the lowlands from the highlands, and the elevation along its outline highly deviates from an equipotential surface [8,9], and thus it is not a good candidate to paleoshoreline. The topography along the Arabia shoreline is characterized [9] by a mean altitude of −2.1 ± 1.4 km, and a total elevation range of ~5.6 km (from 1.6 to −4.0 km).

The Meridiani shoreline has been mapped in northern Sinus Meridiani and western Arabia Terra [3,4], but its topography has not been examined in previous works. We have found elevations along this putative paleoshoreline mostly between 0 and −2 km. If Hesperian chaos materials, impact craters, and an isolated peak are not taken into account, the total elevation range is ~1 km, from −0.5 to −1.5 km, a reasonable amount for a very old paleoshoreline.

Elevation range of the Meridiani/Arabia shoreline: Figure 2 shows Meridiani and Arabia shorelines, as mapped by [4], and constant elevation contours (0.5 km spaced) crossed by the Meridiani shoreline. It can be seen that elevations of the Arabia shoreline at northeastern Arabia, Utopia, and Elysium regions are similar to these along the Meridiani Shoreline, which support the "mixed" Meridiani/Arabia shoreline as a true paleoshoreline. Also is evident that elevations in the Arabia shoreline are much lower in northwestern Arabia Terra, as well as further to the west.

The Arabia shoreline at northeastern Arabia, Utopia, Elysium, and Amazonis regions is well close to the −1.5 km elevation level at the majority of places (see Figure 2), further supporting the "mixed" Meridiani/Arabia shoreline as a true paleoshoreline. The lower elevation of the Arabia shoreline in those regions (with the exception of Isidis impact basin, which probably postdates paleoshoreline formation) is −2.1 km. Thus, the whole topographic range in the Meridiani/Arabia shoreline would be ~1.6 km, between −0.5 and −2.1 km. This is still far of an equipotential surface, but this Meridiani/Arabia shoreline would be better candidate to represent a paleoequipotential surface than the Arabia shoreline *sensu strito*.

Implications for vertical movements of the lithosphere: The fit, although rough, of paleoshorelines to equipotential surfaces would imply a relatively calmed history for the Martian lithosphere since these features were formed [10]. The evidences for a reasonably equipotential Noachian paleoshoreline are attractrive, but they must be taken more carefully. If the Meridiani/Arabia shoreline represents a true paleoshoreline, then its whole elevation range of 1.6 km would imply a quite stable lithosphere since 3.5 Gyr ago at least.

References: [1] T.J. Parker et al., *Icarus 82*, 111-145, 1989. [2] T.J. Parker et al., *JGR 98*, 11,061-11,078, 1993. [3] K.S. Edgett and T.J. Parker, *GRL 24*, 2897-2900, 1997. [4] S.M. Clifford and T.J. Parker, *Icarus 154*, 40–79, 2001. [5] J. Ruiz et al., *LPSC XXXIV*, 1090, 2003. [6] V.E. Webb, *JGR 109*, E09010, 2004. [7] Ruiz, J., *LPSC XXXVI*, 1135, 2005. [8] J.W. Head et al., *Science 286*, 2134-2137, 1999. [9] M.H. Carr and J.W. Head, *JGR 108*(E5), 5042, 2003. [10] J. Ruiz, *JGR 108*(E11), 5122, 2003.

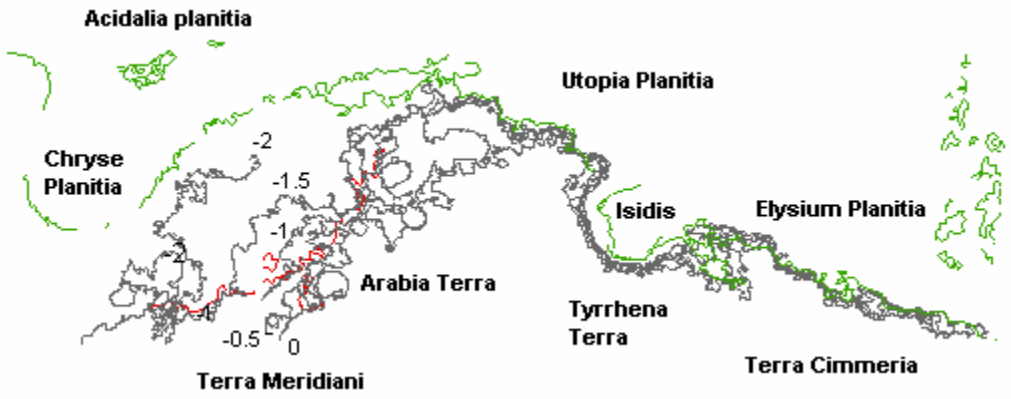

Figure 1. Meridiani (red) and Arabia (green) shorelines, and constant elevation contours in km (black) crossed by the Meridiani shoreline, which are spaced each 0.5 km..

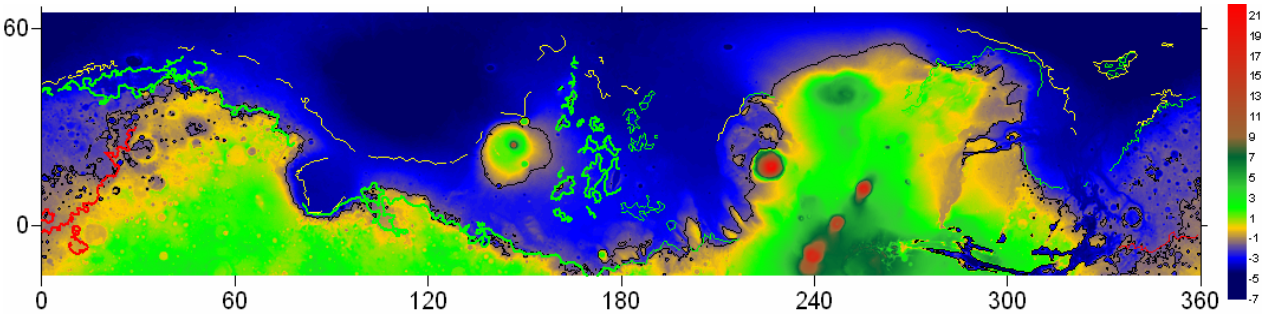

Figure 2. Paleoshorelines proposed by [4] superimposed on the MOLA topography (scale in km). Colors indicate Meridiani (red), Arabia (green), Deuteronilus (yellow) and shorelines. Also represented (black) is the contour of the -1.5 km elevation level.